

– Claim 6. (Amended) [A] The structure according to claim 3 wherein said perforation is a portion coupled to an adjacent through-hole. –

– Claim 9. (Amended) [A] The structure according to claim 3 wherein a plurality of said perforations form [a] cantilevered flaps about more than one of said through-holes. –

REMARKS

The present invention relates to a method for making an interconnector to couple an electric module to a circuit board. The invention provides a probe structure that is an integral part of the fan out wiring on the test substrate or other printed wiring means to minimize the electrical conductor length as well as contact resistance of the probe interface. The probe is provided with a compliant interface to compensate for slight variations in the rigid bond pad heights on the IC device and variations in the height of the probe contacts.

The Examiner has indicated that the present invention is unclear to him referring to claim 1 and the language contained therein. The “means for permitting each of said second ends to move about reference positions” is explained in the specification on pages 12-13 referring to the elements depicted in Figure 8. The means for permitting the second ends to move are a combination of the perforations 24 which define cantilevered sections 23. These cantilevered flaps are secured to the sheet and thus are flexible and can move along a horizontal-vertical axis (the “reference position”)

The “sheet” of material referred to in claim 1 is element 20 in Figure 1. The perforations are described above and are depicted in Figure 8 which is a top view as element 23.

Claim 3 has been rewritten to retain the recitation of the “perforation” element which is referred to in Claim 9.

As to the inquiry about Claim 4, the perforations are depicted in Figure 8 as element(s) 23.

The dielectric material referred to in claim 12 is an insulating material and is depicted in Figure 6 as element 22. Figure 6a, newly included herewith, depicts an alternate embodiment of Figure 6 and is defined in Claim 12. Sheet 20 comprises two distinct layers 20a, a dielectric material, e.g. a polymer such as polyimide and 20b which is an electrically conducting layer of metal. This composite sheet 20a and 20b in Figure 6a has a plurality (not shown) of openings 21 (holes) therethrough of the type depicted. Ball 16 is insulated from contacting the metallic sheet 20b by the dielectric material extending into opening 21. There is no new matter added by virtue of the addition of the drawing and language to the specification since the antecedent basis for the insertion is found in Claim 12 as originally filed.

The sheet for the connecting device is an alignment fixture so as to provide consistent pressure between the contacts of a module being interconnected, the interconnecting device and a connecting article. This feature is shown in Figure 1, element 23.

In Claim 26, the elements of holding said substrate means for retractable moving of said structure of Claim 1 toward and away from said electronic device and means for applying the electronic signal applied through the substrate is depicted in Figure 1 wherein the electrical signal is supplied through substrate 11 through pad 13, ball, wires 15 to second end 16 ball contact. Ball contact 16 contacts the electronic device 30.

In Claim 28, the nature of the dielectric material is an insulating material and is exemplified in Figure 15 wherein element 120 is the dielectric material.

Claim 32 covers a dielectric sheet of rigid material which is shown in Figure 1 as element 20 has 2 layers.

An elastomer is found in Figure 7 and is denoted element 17.

"Invar" material is a sheet of alloy containing 63.8% iron, 36% nickel and 0.2% carbon. It is a material having a low coefficient of expansion and is well known in the art. A useful polymeric material used in the present invention where the term "polymer" is used is a polypyromelitimide made by DuPont bearing the trademark "KAPTON."

The list of objections answered above provide clarification of the language in Claims 1 to 60.

The attention of the Examiner is directed to the specification, pages 10 - 15 which in the course of discussing the Figures, details the elements found in the present invention and covered in the claims.

The Examiner is respectfully requested to reconsider his rejection of Claims 1-49 and 51-60 under 35 U.S.C. 103(a) as being unpatentable over United States Patent 5,225,777 to Bross, et al.

The Bross, et al. system is different from Applicants' invention. In Bross, et al., elongated wire 40 is not a bonded free-standing wire inserted between the layered sheet. Applicants use a ball-bond contact mechanism which is totally different. Applicants have a flap to control the movement of the probe in the two or three dimensional planes. Bross, et al. rely on the buckling of their wire to move in the vertical direction.. Bross et al. have difficulty controlling the movement of the contact in the xy plane through their buckling of the system. The benefit of Applicants' invention is that their wire always moves in the same direction so that there is predictability in the movement of their wire and contact. The wire in Bross, et al. can go in either direction and the direction of contact is always unpredictable. The contact position accuracy of the Bross, et al. is poor.

The structure of Bross, et al. is totally different from the article presently claimed in Claim 1. Bross, et al. do not disclose a sheet (20 - Figure1) which contains the cantilevered flats which can independently move up and down. Further the reference does not disclose the claimed protuberances (i.e., the ball shaped, etc. probe tips bonded to the fan out wiring and ideal for a wiping interface).

The Examiner is respectfully requested to reconsider his rejection of Claim 50 under 35 U.S.C. 102(b) as being anticipated by United States Patent 5,371,654 to Beaman, et al.

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Beaman, et al. disclose a three-dimensional interconnection package. They, like the other prior art cited, do not disclose a sheet (20 - Figure1) which contains the cantilevered flats which can independently move up and down. This feature is essential to the advance in the art.

The Beaman, et al. reference has the identical assignee as the present invention as well as the three inventors (Beaman, Lauro and Shih).

The Examiner is respectfully requested to reconsider his rejection of Claim 50 under 35 U.S.C. 102(b) as being anticipated by United States Patent 3,795,037 to Luttmer.

Luttmer discloses an electrical connection package wherein the elongated connectors are embedded in a block of elastomeric material. He does not disclose a sheet (20 - Figure1) which contains the cantilevered flats which can independently move up and down.

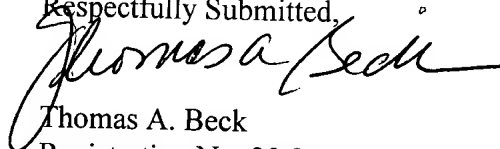
The references to Beaman, et al. and Luttmer do not disclose each and every element found in the claims of Applicants' application. Thus the rejection of Claim 50 is inappropriate.

Applicants' attorney has attempted to revise the claims so that they clearly distinguish over the references cited. If the Examiner believes that there are other modifications to be made

to the other claims which would result in their allowability, Applicants' attorney would be willing to discuss the matter with the Examiner by telephone at a mutually convenient time.

In view of the arguments and modifications to the claims, allowance of this case is warranted. Such favorable action is respectfully solicited.

Respectfully Submitted,



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I hereby certify that this paper is being deposited on the date indicated below with the U.S. Postal Service as First Class Mail addressed to Commissioner of Patents & Trademarks, Washington, D.C. 20231

Signature: 

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Thomas A. Beck

Date: April 7, 2001



Version with ~~Modifications~~ to Show Changes Made 09/254,769

IN THE SPECIFICATION:

Page 12, after line 11, insert as a separate paragraph:

– Figure 6a depicts an alternate embodiment of Figure 6. Sheet 20 comprises two distinct layers 20a, a dielectric material, e.g. a polymer such as polyimide and 20b which is an electrically conducting layer of metal. This composite sheet 20a and 20b in Figure 6a has a plurality (not shown) of openings 21 (holes) therethrough of the type depicted. Ball 16 is insulated from contacting the metallic sheet 20b by the dielectric material extending into opening 21. --

IN THE CLAIMS:

Rewrite the following claims:

– Claim 1 (Amended) A structure comprising:

a substrate having a surface;

a plurality of bond wire elongated electrical conductors extending away from said surface;

each of said bond wire elongated electrical conductors having a first end affixed to said surface and a second end projecting away from said surface;

there being a plurality of said second ends;

said first end and said second end of said bond wire elongated electrical connector having a ball-shaped protuberance positioned thereon;

[a] means for permitting each of said plurality of said second ends to move about reference positions. –

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– Claim 3 (Amended) [A] The structure according to claim 1 wherein said means for permitting each of said plurality of second ends to move about reference positions is a sheet of material having a plurality of through-holes therein through which said second ends project, [therebeing] there being a perforation in said sheet in the vicinity of said openings. –

– Claim 6. (Amended) [A] The structure according to claim 3 wherein said perforation is a portion coupled to an adjacent through-hole. –

– Claim 9. (Amended) [A] The structure according to claim 3 wherein a plurality of said perforations form [a] cantilevered flaps about more than one of said through-holes. –

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IN THE CLAIMS:

Rewrite the following claims:

– Claim 1 A structure comprising:

a substrate having a surface;

a plurality of bond wire elongated electrical conductors extending away from said surface;

each of said bond wire elongated electrical conductors having a first end affixed to said surface and a second end projecting away from said surface;

there being a plurality of said second ends;

said first end and said second end of said bond wire elongated electrical connector having a ball-shaped protuberance positioned thereon;

means for permitting each of said plurality of said second ends to move about reference positions. –

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Claim 3 The structure according to claim 1 wherein said means for permitting each of said plurality of second ends to move about reference positions is a sheet of material having a plurality of through-holes therein through which said second ends project, there being a perforation in said sheet in the vicinity of said openings.

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Claim 6. The structure according to claim 3 wherein said perforation is a portion coupled to an adjacent through-hole. -

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Claim 9. The structure according to claim 3 wherein a plurality of said perforations form cantilevered flaps about more than one of said through-holes. -